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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/528,381	06/01/2005	Frank K. Crundwell	20914/0202652-US0	6871
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DARBY & DARBY P.C. P.O. BOX 770 Church Street Station New York, NY 10008-0770			EXAMINER SCHUBERG, LAURA J	
			ART UNIT 1657	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/528,381

Applicant(s)

CRUNDWELL ET AL.

Examiner

Laura Schuberg

Art Unit

1657

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 October 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/ are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 10/26/2007 have been fully considered but they are not persuasive. Applicant's arguments with respect to claims 7-9 and 13-15 have been considered but are moot in view of the new ground(s) of rejection. The arguments have been addressed in so far as they relate to the rejections below.

Applicant argues that the object of the MacLeod method is to plug a structure, which is the opposite from the claimed invention, i.e. to spread bacteria evenly throughout the heap and then reactivate them to enhance oxidation. Applicant asserts that MacLeod does not teach or suggest reactivating the production of exopolymers on the external walls of the microorganism in order to form activated microorganisms that accelerate the dissolution of minerals in a heap leaching pile by enhancing oxidation reactions.

This is not found persuasive because MacLeod specifically teaches that deeper penetration of a greater number of bacterial cells into a porous matrix is a significant benefit achieved by the use of bacterial cells without the glycocalyx layer (exopolymers) (page 1370, column 2-page 1371, column 1). Clearly MacLeod does not teach away from spread bacteria evenly throughout a matrix (or heap). In addition, MacLeod also teaches the cell distribution in the cores injected with starved cells is to be followed by nutrient injection (nutrient stimulation) in order that the injected cells are not simply washed away, but remain uniformly distributed in the core (page 1371 column 2). While

Art Unit: 1657

MacLeod is performing this technique for a different reason than Applicant's claimed invention, the benefits of maintaining a uniform distribution of bacterial cells in a porous matrix is also indicated as desirable for heap leaching by Brierley (column 8 lines 62-65) as well.

Applicant argues that the skilled artisan would realize that the characteristics of the low permeability sandstone formations are so dissimilar to those of a high permeability heap formed from crushed rock for heap leaching, that the techniques disclosed by MacLeod could not be successfully applied in heap leaching to improve oxidative reactions.

This is not found persuasive because, while the method of MacLeod may be different, an artisan of ordinary skill in the art would have recognized that the use of bacteria devoid of their exopolymers (such as ultramicrobacteria, UMB) would be beneficial in any method that involved the contact of bacteria within the pores of a porous matrix, such as in heap leaching. Brierley repeatedly emphasizes the importance of a uniform distribution of bacteria in heap leaching demonstrating the need for the application of a technique that would enhance the penetration of bacterial cells (column 8). An artisan of ordinary skill in the art of bacterial manipulation has good reason to pursue the known options within his or her technical grasp (*KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (US 2007)).

Applicant argues that Brierley does not disclose or suggest the reactivation of bacteria to form activated microorganisms that accelerate the dissolution of minerals by oxidative reactions.

This is not found persuasive because MacLeod teaches that the cell distribution in the cores injected with starved cells is to be followed by nutrient injection (nutrient stimulation) in order that the injected cells are not simply washed away, but remain uniformly distributed in the core (page 1371 column 2). In addition, Brierley specifically teaches nutrient stimulation is included in heap leaching as well (column 16 lines 42-63). The fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-6, 10-12, 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brierley et al. (US 6,383,458) in view of MacLeod et al. (Applied and Environmental Microbiology, 1988).

The claims are drawn to a method of introducing microorganisms into a heap for bio-assisted heap leaching comprising: a) preparing microorganisms without exopolymers on their external cell walls; b) adding these microorganisms to a heap; c) reactivating with or without assistance the production of exopolymers wherein the activated microorganisms accelerate the dissolution of minerals by oxidation reactions. Dependent claims include limitations drawn to the conditions of the heap, nutrients and preparation of the microorganisms.

Brierley et al teach a method for the recovery of a desired metal from an ore material by adding microorganisms to a heap. The microorganisms are distributed throughout the ore mass as it is being treated for deposition on a heap (during formation) (column 8 lines 59-65) or by drip irrigation or spraying (column 17 lines 12-

Art Unit: 1657

65). Air (includes carbon dioxide) and oxygen are injected into the heap (column 19 lines 17-25) as well as a nutrient solution (column 16 lines 42-63).

Brierley et al do not teach the use of microorganisms without exopolymers or re-activation of the production of the exopolymers.

MacLeod et al teach the ability of starved bacteria (ultramicrobacteria-UMB) to penetrate further into cores than the normal size vegetative cells (abstract). The cells were starved by limiting the amount of carbon available (page 1365-1366) resulting the loss of exopolymers (glycocalyx) (page 1370, column 1). The reference teaches that using traditional vegetative bacteria; the greatest numbers are attached near the inlet of a matrix and this adhesion is irreversible (page 1370, column 2). The reference teaches that the thick aggregation of bacteria and glycocalyx at the inlet area may have physically prevented the substrate from reaching all the cells, or it may have reduced dissolved oxygen levels, consequentially, a lower measure of cell respiration would have been obtained (page 1371 column 2). In contrast, cells starved for nutrients for 2 weeks prior to injection (also known as ultramicrobacteria or UMB) were observed to be distributed uniformly throughout the matrix, thus allowing the deeper penetration of a greater number of bacterial cells (page 1370, column 2-page 1371 column 1). Nutrient stimulation following cell distribution allows the cells to lose their metabolic dormancy and produce reductions in core permeability due to cell growth and polymer production (abstract) and thus re-activating production of exopolymers.

Therefore, one of ordinary skill in the art would have been motivated to use UMB in the method of Brierley et al because MacLeod et al teach that use of these cells

Art Unit: 1657

allows for deeper penetration of a greater number of bacterial cells (page 1370, column 2-page 1371 column 1). One of ordinary skill in the art would have been motivated to re-activate the UMB with nutrient stimulation (as taught by both Brierley et al and MacLeod et al) because MacLeod et al teach that nutrient stimulation following cell distribution allows the cells to lose their metabolic dormancy and produce reductions in core permeability due to cell growth and polymer production (abstract). One of ordinary skill in the art would have had a reasonable expectation of success because Brierley et al teach that it is desirable to improve the penetration of the bacteria to achieve a more uniform distribution (column 3 lines 50-62)(column 17 lines 12-25) and that it is understood that modifications and variations may be resorted to for improvement (column 27 lines 45-52).

The limitation of "wherein the activated microorganisms accelerate the dissolution of minerals by oxidation reactions" is deemed to be an inherent result of using microorganisms (such as UMB) in a heap leaching method. The fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

Therefore, the combined teachings of Brierley et al and MacLeod et al render obvious the invention as claimed.

Claims 7-9 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brierley et al. (US 6,383,458) in view of MacLeod et al. (Applied and Environmental Microbiology, 1988) as applied to claims 1-6, 10-12, 16-18 above, and further in view of Hackl et al (US 4,987,081).

Claims 7 and 13 include the step of imbedding a carbon source in the heap.

Claims 8 and 14 include wherein the carbon source comprises carbonate.

Claims 9 and 15 include wherein the solid nutrients of step a) comprises slow release nutrients.

Hackl et al teach a method for oxidizing multimetallic sulphide ores and concentrates using a combination chemical/biological leaching process and at least three different types of bacteria (abstract). The bacteria require certain nutrients, the most important of which are sources of nitrogen, phosphorus and carbon dioxide (column 5 lines 40-42). Sources of carbon dioxide include gas which can be injected or any carbonate source which will form carbon dioxide (column 5 lines 50-56). Many of the same types of bacteria (column 6 lines 40-65) are used as those disclosed by Brierley et al (column 14 lines 45-55).

Therefore, one of ordinary skill in the art would have been motivated to use the carbonate as a carbon source as well as a slow release nutrient form for the method of Brierley et al because Hackl et al teach that these are known in the art to be beneficial for heap leaching. One of ordinary skill in the art would have had a reasonable expectation of success because Brierley et al teach that nutrients that are known in the

Art Unit: 1657

art as being desirable for promoting microbial activity within a heap leaching process are suitable for the method taught (column 16 lines 42-63).

Therefore, the combined teachings of Brierley et al, MacLeod et al and Hackl et al render obvious Applicant's invention as claimed.

Conclusion

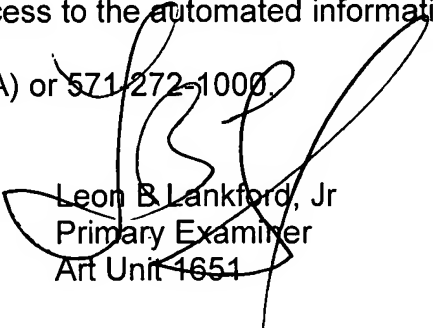
No claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Laura Schuberg whose telephone number is 571-272-3347. The examiner can normally be reached on Mon-Fri 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jon Weber can be reached on 571-272-0925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1657

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Leon B. Lankford, Jr.
Primary Examiner
Art Unit 1651

Laura Schuberg